the latter began to feel the approach of old age, and the prospect of a speedy termination of this important undertaking became more and more doubtful, when, in the year 1872, a young German scholar, Dr. Sachau, boldly stepped into the breach, and promised to devote all his time to this great enterprise. After fifteen years of hard work he has redeemed his pledge. He has given us the Arabic text of Al-Bîrûnî, and he is now engaged in printing an English translation of it. We doubt whether anyone could have been found so well qualified for the task. Dr. Sachau has long been known as a hard-working, honest, and thoroughly sound scholar. He stands in the first rank among the students of Arabic and Persian, and he possesses, at the same time, a fair knowledge of Sanskrit. He is now one of the brightest stars in the Univerity of Berlin, and has lately been appointed there as Director of the newly-founded Imperial School of Oriental Languages. He was well prepared for his task by having previously published another work of Al-Bîrûnî's, the text and English translation of "The Chronology of Ancient Oriental Nations." Few people can appreciate the enormous difficulties of publishing for the first time an Oriental text like that of Al-Bîrûnî. Dr. Sachau was, no doubt, more fortunate than his predecessors in securing a manuscript of Al-Bîrûnî's, belonging to M. Schefer, which professes to have been copied from a copy in the handwriting of the author. But even thus the labour of editing and translating such a text, which had never been edited and translated before, was enormous. When speaking of the difficulties which he had to overcome in editing Al-Bîrûnî's chronological work, Dr. Sachau writes: "I have boldly attacked the sometimes rather enigmatic style of the author, and if I have missed the mark, if the bewildering variety and multiplicity of the subject-matter have prevented my reaching the very bottom of every question, I must do what more or less every Oriental author does at the end of his work —humbly ask the gentle reader to pardon my error and correct it." There is the true ring of the *bonâ fide* scholar in this. No one is nowadays considered a real Oriental scholar who has not won his spurs by an *editio princeps*. After a text has once been constituted by a comparison of manuscripts more or less faulty; after a translation has once been accomplished, however imperfect, it is easy enough to print a new so-called critical edition, or a new so-called improved translation. But the scholars who take the first, and the scholars who take the second, step belong to different races. They differ as Columbus who discovered America differs from the traveller who now crosses the Atlantic in seven days. "Generations of scholars," as Dr. Sachau says, "have toiled to carry the understanding of Herodotus to that point where it now is, and how much is wanting still!" To expect, therefore, that Al-Bîrûnî's text, as edited here for the first time, or its translation, should be free from mistakes would only show a complete ignorance of the conditions under which Oriental scholars have to work. There may be hereafter better editions of Al-Bîrûnî; there never can be one so creditable to its author as this *editio princeps*. We could have wished that a work of such importance to students of Indian history had been carried out by an English scholar. But, failing that, we have at least the satisfaction that the expense of publishing the Arabic original of the "Indica" has been generously defrayed by the Indian Government, following in this respect the noble example set by the patron of Al-Bîrûnî himself, the powerful Sultân Mahmûd of Ghazna.

THE SCIENTIFIC WRITINGS OF JOSEPH HENRY.

The Scientific Writings of Joseph Henry. Two Vols. 8vo, pp. 1082. (Washington: Smithsonian Institution, 1886.)

UNDER the above title, two handsome volumes have recently been published by the Smithsonian Institution, Washington, containing the papers published by its late distinguished Secretary in various scientific serials through the long period of fifty-four years. It is characteristic of the man that, although for thirty-two of those years he had almost unrestricted command of the publishing resources of that great institution, not one of his papers was given to the world through the medium of the "Smithsonian Contributions" or "Miscellaneous Collections," or in any way at the expense of its funds. They range over a great variety of subjects, chiefly in electrical physics and meteorology, and in date from 1824 to 1878.

As may be inferred from the earlier of these dates, when Faraday was still an assistant to Sir Humphry Davy, in the laboratory of the Royal Institution, and Henry a private tutor in a family at Albany, New York, many of these papers are reprinted for their historical interest rather than for their present scientific value; but his fellow-countrymen, in acknowledging Faraday's pre-eminence, delight to point out in how many particulars Henry walked *pari passu* with him in the then nearly untrodden paths of electro-magnetism, under immense relative disadvantages. As early as 1835, Henry, then a Professor at Princeton, New Jersey, connected his residence with his laboratory in the Philosophic Hall by a telegraph, in which the galvanic circuit was completed through the earth—probably the first realization of that familiar property on which all our telegraph circuits are now dependent. It was a little later (in 1842) that he showed the writer of this short notice, under promise of secrecy, an experiment which at the moment greatly interested him. A long bar of iron was wrapped in a coil or ribbon of copper, half an inch wide; two copper wires, each terminating in a small ball, were soldered to the bar. On holding these balls to the ears, and transmitting a strong current through the coil, a very distinct musical note was heard each time the current was made or broken. He narrowly missed forestalling Faraday in the great discovery of producing electric currents by the rotation of an electro-magnet or movement of its armature. Henry caused an electro-magnet of unusual power to be constructed in August 1831, with a view to realizing his conceptions on this subject. He was at the time accidentally interrupted in pursuing his experiments, and did not resume them until May or June 1832; and in the meantime (in February 1832) Faraday had made his independent discovery.[1] As early as 1843, Henry proposed "a new method of applying the instantaneous transmission of an electrical action to determine the time of the passage of a (cannon) ball between two screens, placed

---

[1] *Philosophical Magazine*, April 1832.

© 1888 Nature Publishing Group

at a short distance from another in the path of the projectile," and contrived a self-recording apparatus reading to the one-thousandth part of a second. As at that time Hutton and the ballistic pendulum reigned supreme—and this is not an experiment easily made in a laboratory—it does not appear that he carried it out. Perhaps the most elaborate of his numerous researches is that on the transmission of sound in relation to fog-signalling, carried on at the expense of the United States Lighthouse Board for several years from 1865 onwards, concurrently with those on which Prof. Tyndall was at that time engaged for the Trinity Board. That these distinguished men did not always meet with the same effects, or draw the same conclusions from them, is but a natural consequence from the extreme complexity of the phenomena.

The great work of Prof. Joseph Henry's life—in which his strength and calmness of judgment, his high-minded independence and self-effacement, enabled him to achieve the highest results—was the organization of the Smithsonian Institution upon its present liberal basis, in the face of not a little opposition from persons of more contracted views.

"These I's are *egos*, and not *oculi*," is a line from some forgotten squib which he was wont to quote when self-interest seemed to obscure the only interest precious to him—that of science in its widest scope, and the advancement of human knowledge. He lived to see the wisdom of his policy gratefully acknowledged by his countrymen and the scientific world. Although a very fertile inventor, and the author of many ingenious contrivances now in use to facilitate the working of the electric telegraph, he never patented anything. In his own words, he "did not consider it compatible with the dignity of science to confine the benefits which might be derived from it to the exclusive use of any individual." The expression is not carefully chosen; it simply means that he declined to derive selfish advantage from his discoveries. A very brief and modest statement by himself of what these were in relation to the electro-magnetic telegraph is reprinted in vol. ii. from the Smithsonian Annual Report for 1857. In collecting and reprinting these papers, the Institution has raised a worthy monument to Henry's memory, and made a valuable contribution to the history of physical science.

J. H. L.

AN ELEMENTARY TEXT-BOOK OF PHYSIOLOGY.

An Elementary Text-book of Physiology. By J. McGregor Robertson, M.A., M.B., Senior Assistant in the Physiological Department, University of Glasgow. 350 pp. (London: Blackie and Son, 1887.)

IN compiling this volume the author has sought to "present the essential facts and principles of physiology, not in a series of disconnected paragraphs, but woven into a continuous story." This being so, we look for a readable book rather than for the more empirical treatise nowadays predominant; and the the success of the work must consequently depend, in the main, upon the manner in which the narrative is strung together. That the book really is a readable one there can be no doubt, and for style and general accuracy it is very satisfactory. When we consider the method of arrangement adopted, however, we must confess that it is disappointing. The author lays it down as a tenet that "we cannot properly understand the physiology of the human body without reference to the form and build, . . . and thus we shall have to note the main anatomical facts regarding a part of the body before going on to consider the work which that part does." Very proper, and true to the letter. In spite of this, however, the reader is led straight away into a consideration of the chemical constitution of the body as a whole. Surely it would be more logical to treat of the constitution of the several structural elements in order of presentation, deferring the more general statements for a final *résumé*. A similarly dangerous position is approached when the writer deals with structure itself. Chapter II. is devoted to "Elementary Structures," that is to say, the author discusses the structural unit before entering upon a consideration of those organs and tissues which are its aggregates. This is an old grievance, and all experience shows that this method, though at first sight apparently natural, is in reality seductive, if not illogical. It is fair to the author to state that he does not adopt it throughout. In view of it, however, the following statements are the more unfortunate: "cells are little masses of a jelly-like material"; "usually the cell has an outer covering or membrane, called the *cell-wall*"; "from little nucleated masses of protoplasm cells are produced, and then from cells all the other textures of the body are derived."

As the work is of a readable character, we expect, furthermore, to find comparisons and illustrations drawn from the experience of daily life, and in this we are not disappointed. Stock comparisons, like that of the human body with the steam-engine, come in as a matter of course, and in his choice of novel ones the author has been very successful. Nothing can, however, be more easily overdone than this. If, for example, the human eye is compared with the photographer's camera, care ought to be taken to point out in what the two differ, especially when considering the lens in accommodation. This has not been done.

Taking the book as a whole, the author is to be congratulated, and especially so upon his treatment of certain leading topics—notably that of diet. By far the weakest parts of the work are those devoted to histology. The interminable striped muscle question is most feebly treated, and who but the author is to know what is meant by the words "the nerve-tubes end, it has been seen, in the (muscle) fibres"? The description of a secreting gland generally given is so worded as to imply that the "basement membrane" is a leading, if not the chief, constituent thereof. These and other defects referred to in the sequel demand immediate attention, and we would fain see the elimination of such old heresies as the capillary or "hair-like vessel" and the transmission of "messages" along the nerve-fibre. There would appear to be a fatality in the persistency with which teachers of a certain class continue to thrust these and similar stumbling-blocks in the way.

This volume is confessedly designed for the "requirements of candidates for the examinations of the Science and Art Department and of the Local Examination

© 1888 Nature Publishing Group